

A MATHEMATICAL MODEL AND A METHOD
AND APPARATUS FOR UTILIZING THE MODEL

ABSTRACT OF THE DISCLOSURE

The present invention provides a model and a method and apparatus for utilizing the model to simulate an imaging scenario. The model is mathematically defined by analytical basis objects and/or polygonal basis objects. Preferably, the model is a model of the human heart and thorax. Polygonal basis objects are only used to define structures in the model that experience torsion, such as certain structures in the heart that experience torsion during the cardiac cycle. The manner in which the basis objects comprising the model are transformed by scaling, translation and rotation is defined for each basis object. In the case where a basis object experiences torsion, the rotation of the basis object will change as a function of the length along the axis of the basis object about which rotation is occurring. During an imaging system simulation, the model is utilized by a forward projection routine, which integrates the linear attenuation coefficients associated with the rays emitted by a simulated x-ray source and collected by a simulated detector array to obtain line integrals corresponding to forward projection data. The forward projection data is then processed to take into account the physics of the imaging technology, the x-ray source and the detector array. The processed projection data is then processed and back-projected by a reconstruction modeling routine to produce a reconstructed representation of the model of the heart as a function of time.